

Berkeley & Oldbury Site Stakeholder Group

2008 Graphs



Presented at the November 2009 Meeting

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1. INTRODUCTION

This report contains graphs and information on radiation doses to workers at Oldbury Power Station and Berkeley Licensed Site up to the end of 2008. It also includes graphs and information concerning radioactive solid wastes, gaseous and liquid effluent discharges for these sites and results of the district survey programme for the same period.

Oldbury Power Station and the Berkeley Site share a joint environmental monitoring programme due to their close proximity. Oldbury is operated by Magnox North and Berkeley is managed by Magnox South. Oldbury is a second generation Magnox station with two concrete pressure vessel reactors. The station commenced operation in 1967 and generates approximately 420 MWs of electricity when both reactors are operating. During 2008, reactor 1 was shutdown for the whole year and reactor 2 operated for most of the year. The extended reactor 1 outage was due to reactor core inspection and safety-case work. Berkeley Power Station was an early Magnox station that operated between 1962 and 1989. Decommissioning activities continued throughout 2008.

Information on discharges and environmental measurements are sent on a regular basis to the Environment Agency. The Environment Agency is the single regulator for radiological discharges from the Oldbury and Berkeley sites although the Foods Standards Agency remain a consultant to the agency. The Environment Agency carry out their own environmental programmes and issue annual reports summarising their results. Inspectors from the authorising departments visit each site regularly to inspect the company's facilities and discuss results and any issues.

Should anyone have any comments or require any clarification regarding the content of this document please contact the Environment, Health, Safety & Quality Manager, Oldbury Power Station, Oldbury Naite, Thornbury, South Gloucestershire, BS35 1RQ.

2. RADIATION DOSES TO WORKERS

Magnox North and Magnox South have responsibility under the Ionising Radiation Regulations to assess and control the radiation dose of each person working within the site's radiation controlled areas.

The whole body dose received by an individual is measured by an electronic personal dosimeter (EPD) which records the amount and type of radiation received, and provides pre-set audible and visual warnings to enable dose control. The EPD and associated software provides dose information for all individuals working inside the controlled areas.

Control of exposure is achieved by ensuring that all doses are kept As Low As Reasonably Practicable (ALARP) and well below statutory limits. All work activities within the controlled areas are pre-planned and continually assessed to ensure that the ALARP principle is applied.

Oldbury Power Station Total Personnel Radiation Doses

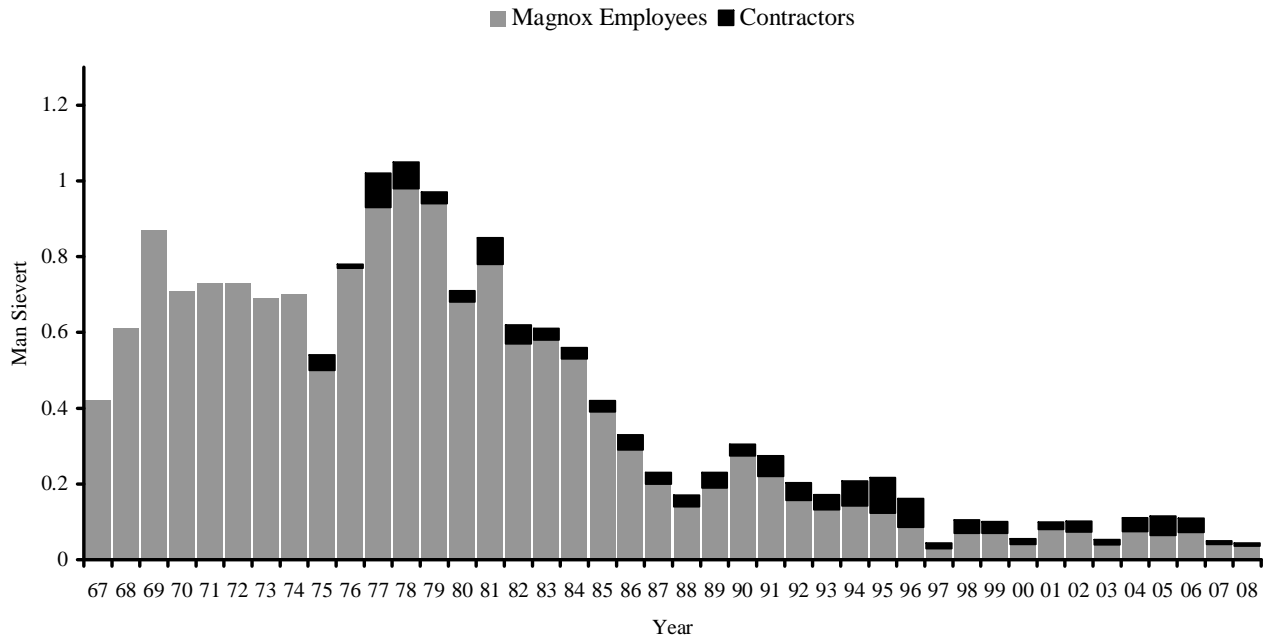
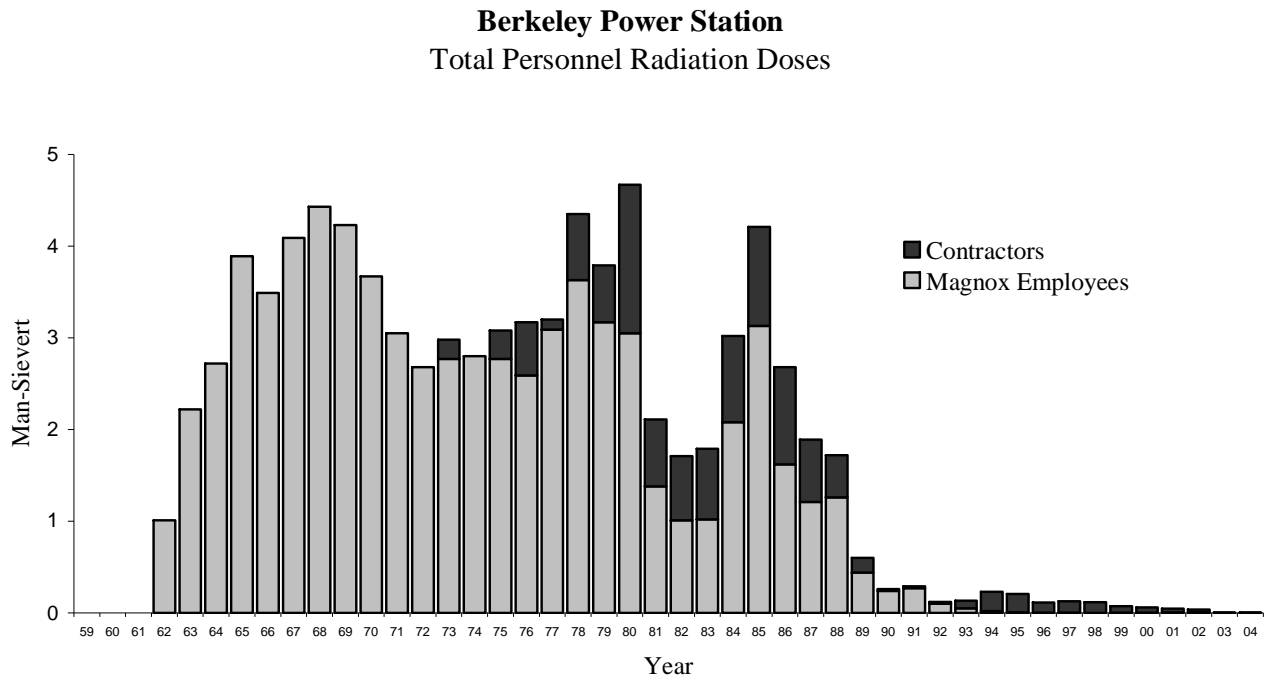


Fig 2.1 *Oldbury Power Station, Total Personnel Radiation Doses*

The total radiation dose to personnel at Oldbury Power Station has remained at low levels in recent years. Low doses in 1997, 2000, 2003, 2007 and 2008 were due to no boiler inspections in those years. Increased contractors' doses between 1994 and 1996 occurred as a result of some planned additional work on boiler internals. Most of the dose accumulated during outage years is due to work in the boilers, which are inside the biological shield wall.

Fig 2.2 *Berkeley Site, Total Personnel Radiation Doses*



This graph shows historic dose to personnel at Berkeley Power Station. The dose for 2005 onwards is included in Fig 2.3, following the amalgamation of the dosimetry services.

Berkeley Site
Total Personnel Radiation Doses

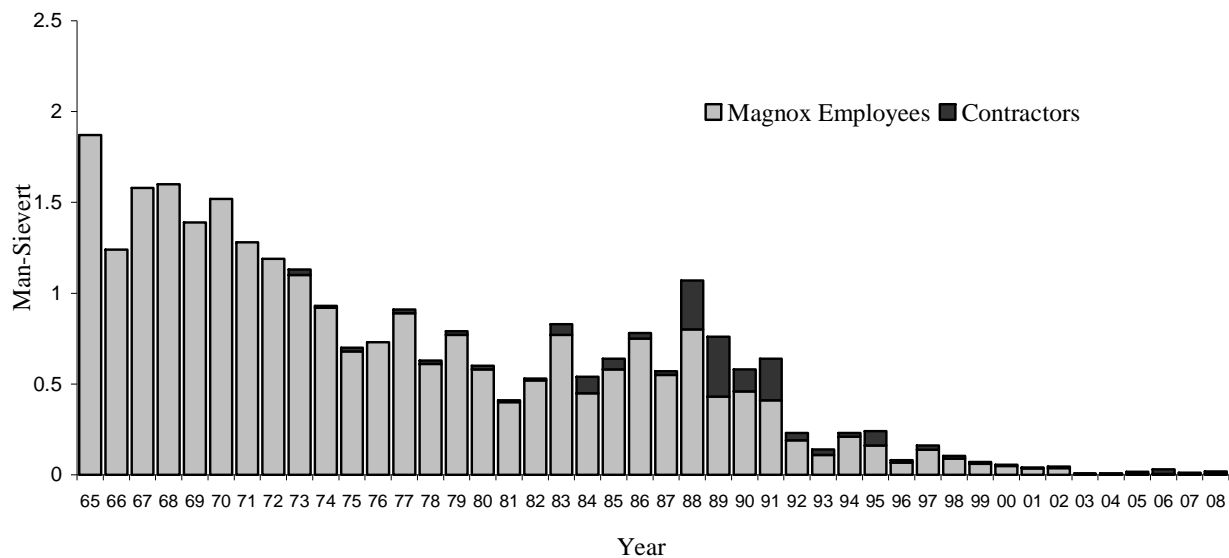


Fig 2.3 *Berkeley Site, Total Personnel Radiation Doses*

The contractor radiation dose was higher between 1988 and 1991 due to refurbishment of cave cells and cooling ponds to receive AGR fuel for Post Irradiation Examination (PIE). The dose for 2005 onwards is for the Berkeley Site, including Berkeley Power Station and doses before 2005 are for just Berkeley Centre/Berkeley Nuclear Laboratories.

Berkeley Centre is now de-licensed from 1st Jan 2007.

3. GASEOUS EFFLUENT DISCHARGES

Site specific authorisations for discharging radioactive gaseous effluent to atmosphere are granted by the Environment Agency under the Radioactive Substances Act.

Authorisation limits are set after considering the actual quantities of radioactivity each site needs to discharge and the need to keep environmental risks below an acceptable level. Best Practicable Means (BPM) is used to minimise discharges and ensure doses to the public are as low as reasonably practicable (ALARP). The sites would be required to justify that any gaseous emissions greater than the Quarterly Notification Level (QNL) were discharged in accordance with BPM.

There is a very considerable safety margin between the authorised limit and the limit that could present a significant health risk to members of the public. In addition, most discharges are well below the authorised limit and any resultant doses to the public are insignificant.

Because radionuclides behave differently in the environment and influence doses to the public in varying amounts, individual authorisation limits are granted for certain radionuclides.

Berkeley Site (Berkeley Power Station & Shielded Area) was issued a revised Environment Agency authorisation on 1st September 2006 for partial de-licensing. Berkeley Centre was de-licensed on 1st January 2007.

Note: Due to Company name change on 1st October 2008, another Certificate of Authorisation was issued to the Berkeley Site.

Oldbury Power Station

Annual Discharges of Radioactive Aerosols - Tritium

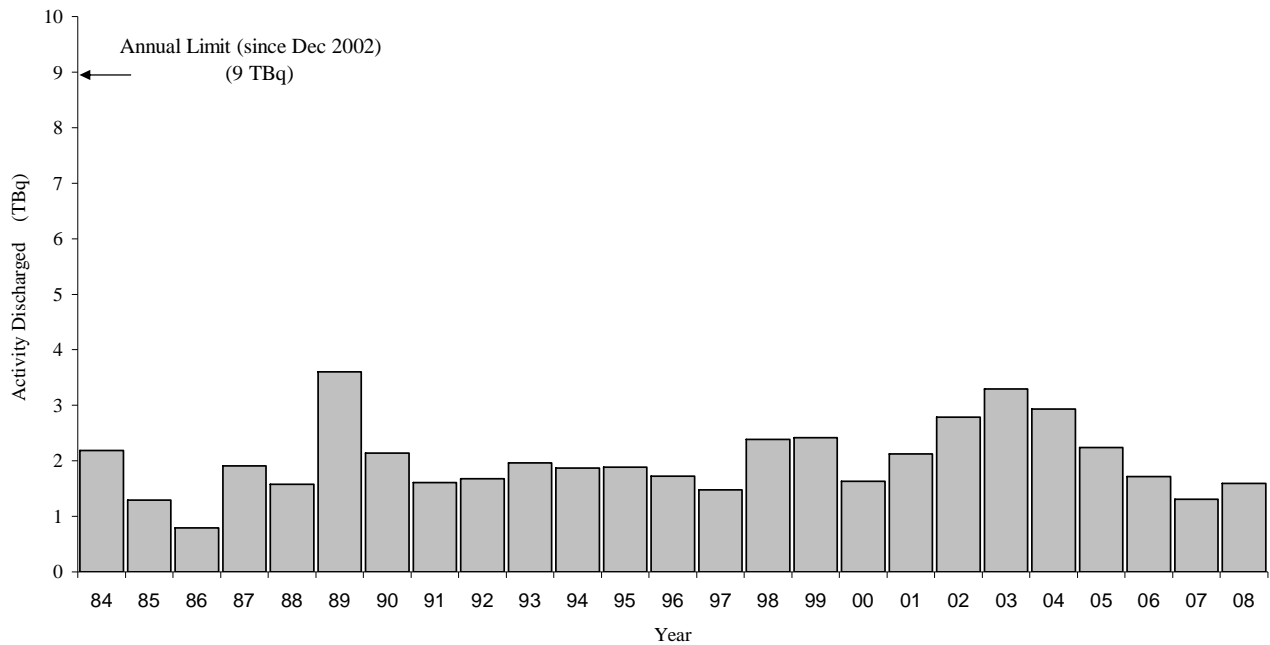


Fig. 3.1 *Oldbury Power Station, Annual Discharges of Radioactive Aerosols - Tritium*

Tritium (H-3) is a low energy beta emitting radionuclide with a low radiotoxicity. It is generated in the reactor by neutron activation of lithium impurities in the graphite core and also directly via the fission process. An improved method of assessing gaseous discharges has resulted in slightly higher levels of tritium being reported in 2003 and 2004 however, the actual amount of tritium discharged has not changed. To account for the improved method an annual limit of 9 TBq was introduced in the authorisation issued by the Environment Agency in December 2002. Although the revised limit represented an 80% increase on the previous limit the effect on the environment and doses to members of the public would be negligible due to the low radiotoxicity of tritium.

Berkeley Site
Annual Discharges of Radioactive Aerosols

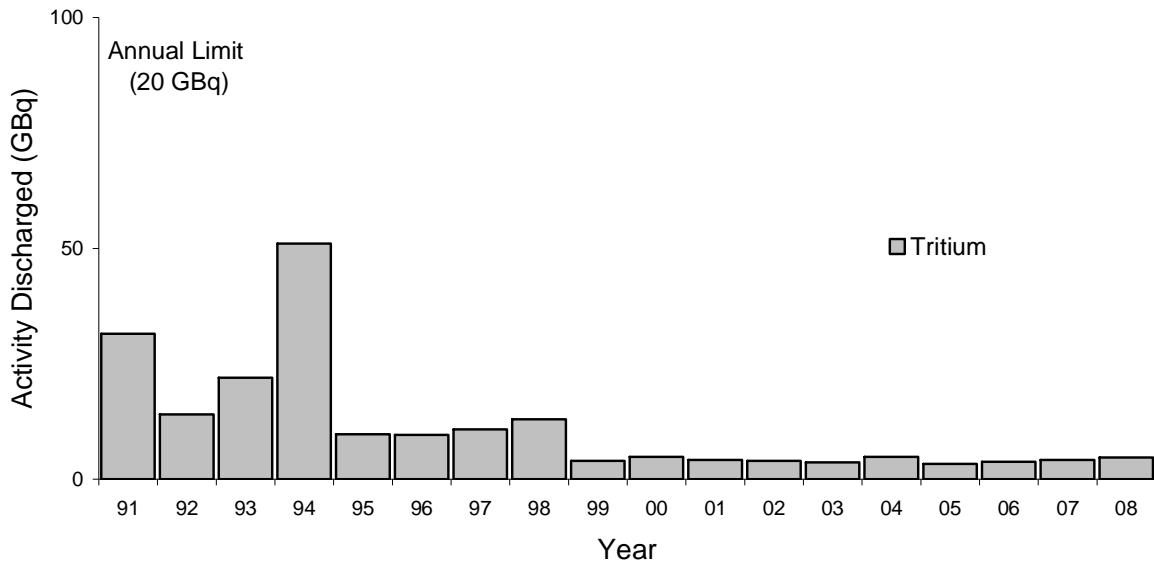


Fig 3.2 *Berkeley Site, Annual Discharges of Radioactive Aerosols - Tritium*

Tritium discharges from Berkeley Power Station reactors are due to natural breathing. The current annual limit of 20 GBq for Berkeley Site was introduced by a revised Environment Agency authorisation issued on 1st September 2006 for partial de-licensing.

Note: Due to Company name change on 1st October 2008, another Certificate of Authorisation was issued to the Berkeley Site.

Oldbury Power Station
Annual Discharge of Radioactive Aerosols - Sulphur 35

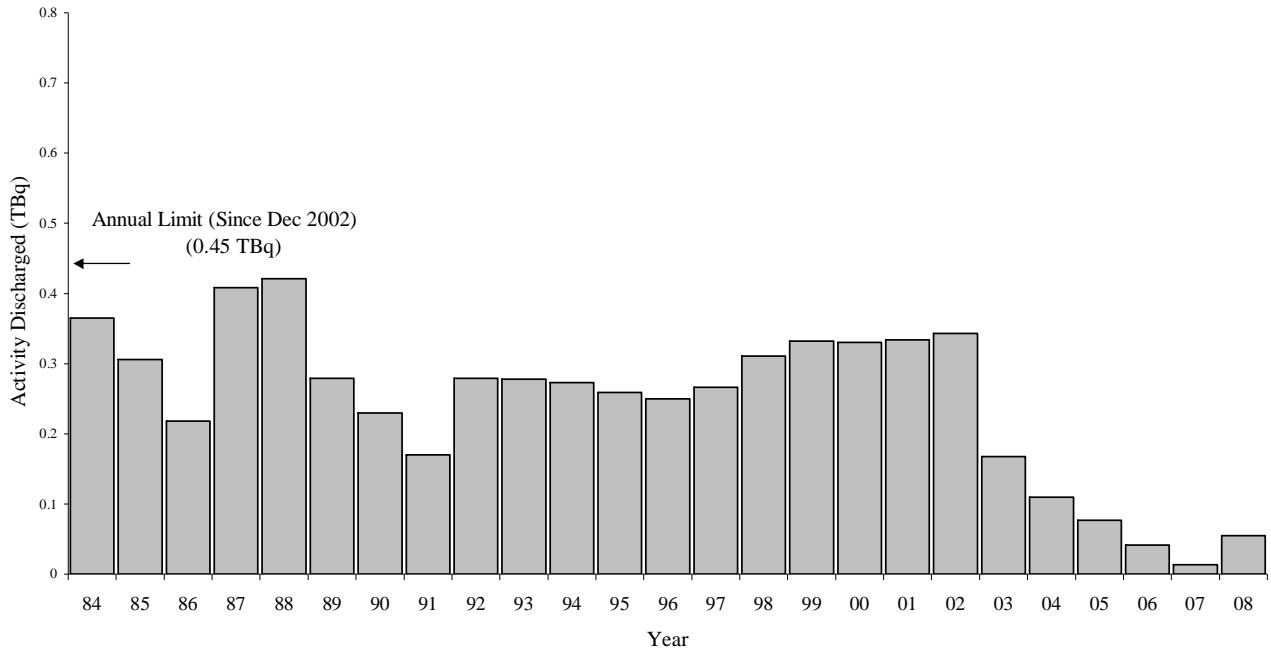


Fig 3.3 *Oldbury Power Station, Annual Discharge of Radioactive Aerosols – Sulphur 35*

Sulphur 35 is a low energy beta emitting radionuclide. It is generated by neutron activation of chlorine impurities in the graphite core and sulphur containing oils. Following a review of systems used during the discharge of radioactive aerosols new analysis equipment was implemented in 2003 to improve the measurement and methodology techniques used for Sulphur 35 assessment. All improved methods were subject to EA acceptance, and a revised lower limit was introduced in December 2002 to account for the improved methodology. The lower limit represented a 40% decrease on the previous annual limit. Sulphur 35 2008 discharges are higher than 2007 due to improved generation.

Oldbury Power Station

Annual Discharges of Radioactive Aerosols - Carbon 14

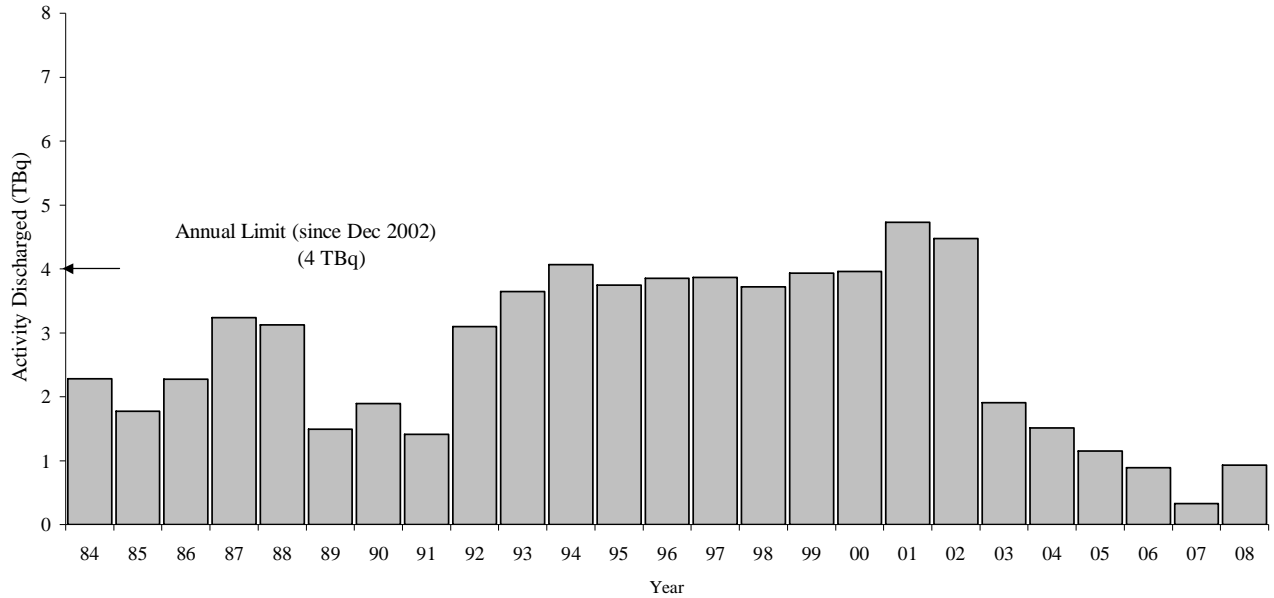


Fig 3.4 *Oldbury Power Station, Annual discharges of Radioactive Aerosols – Carbon 14*

Carbon 14 is a low energy beta emitting radionuclide generated in the reactor by neutron activation of stable carbon, nitrogen and oxygen. Carbon 14 discharges increased during the 1990s due to increased station output and slightly higher in-circuit carbon from the graphite moderator. An improved method of assessing discharges has resulted in lower levels of Carbon-14 being reported, although actual annual discharges remain unchanged. All improved methods were subject to Environment Agency acceptance, and resulted in the introduction of a lower annual limit in December 2002. The lower limit represented a 33% decrease on the previous annual limit. Carbon 14 2008 discharges are higher than 2007 due to improved generation.

Berkeley Site
Annual Discharges of Radioactive Aerosols

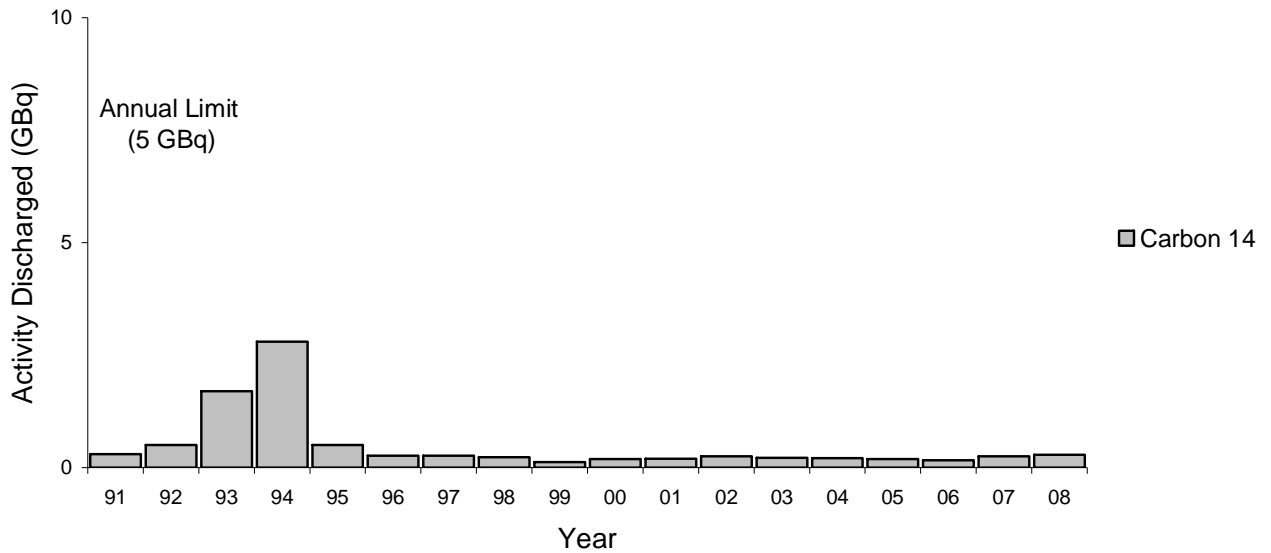


Fig 3.5 *Berkeley Site, Annual Discharges of Radioactive Aerosols - Carbon 14*

Carbon 14 discharges from Berkeley Power Station reactors are due to natural breathing. An annual limit of 5 GBq for Berkeley Site was introduced by a revised Environment Agency authorisation issued on 1st September 2006 for partial site de-licensing.

Note: Due to Company name change on 1st October 2008, another Certificate of Authorisation was issued to the Berkeley Site.

Oldbury Power Station
Annual Discharges of Radioactive Aerosols - Argon 41

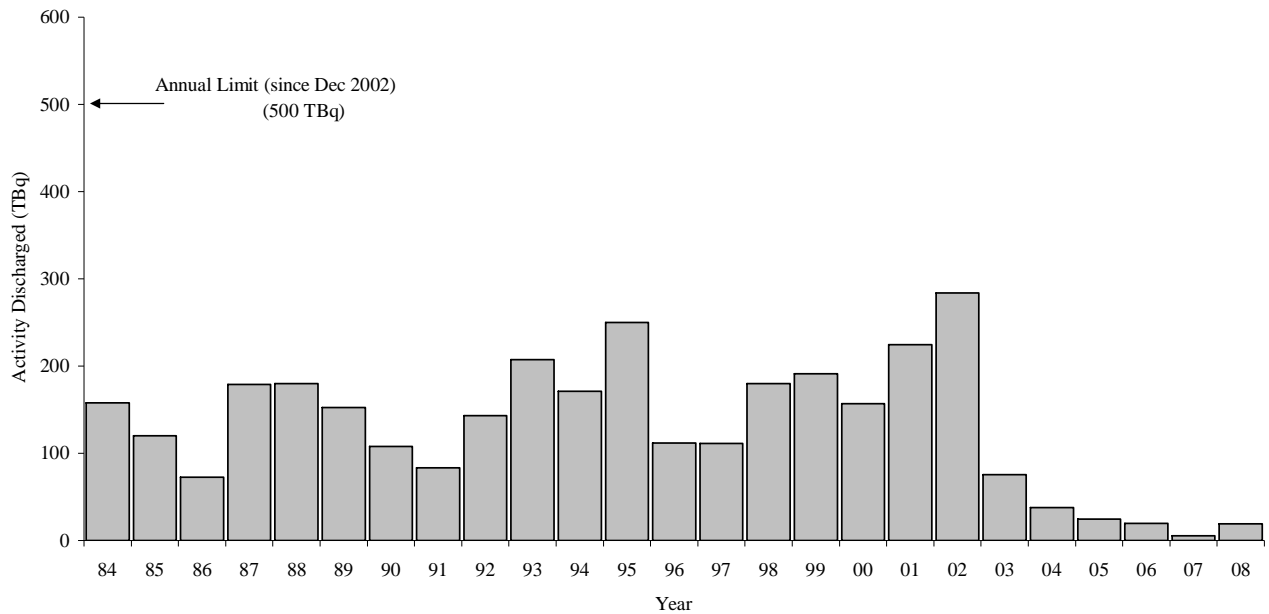


Fig 3.6 *Oldbury Power Station, Annual Discharges of Radioactive Aerosols – Argon 41*

Argon-41 is a beta/gamma emitting radionuclide with a very short half-life (1.83 hours) and is chemically inert. It is generated in reactor gas by neutron activation of stable argon which is a trace element in air and carbon dioxide coolant.

The reduction in the graphical display of argon 41 activity discharged in 2003 and 2004 was due to the movement from a calculated estimate of activity to a measurement based method of assessment, using modern technology to provide a more accurate result. The Argon-41 annual limit did not change with the introduction of the authorisation issued in December 2002. Argon 41 2008 discharges are higher than 2007 due to improved generation.

Oldbury Power Station
Annual Discharges of Radioactive Aerosols - Beta Particulate

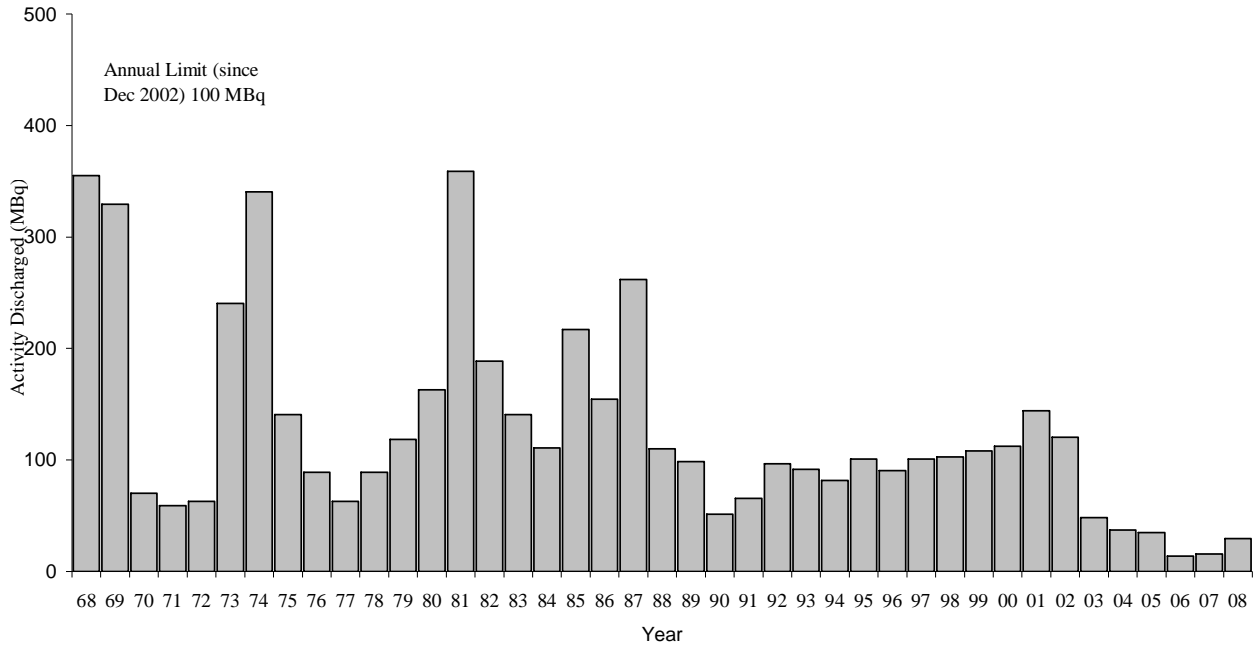


Fig 3.7 *Oldbury Power Station, Annual Discharges of Radioactive Aerosols – Beta Particulate*

All major gaseous discharges are passed through high-efficiency filters that remove 99.9% of all particulate prior to discharge. Particulate material is sampled and analysed for radioactivity. An improved method of assessing discharges has resulted in reported lower levels of beta particulate for since 2002. Following a site review of systems, an annual limit of 100 MBq was introduced by a revised Environment Agency authorisation issued in December 2002. This revised annual limit represents a reduction in the annual limit of 90%. Beta particulate 2008 discharges are higher than 2007 due to improved generation.

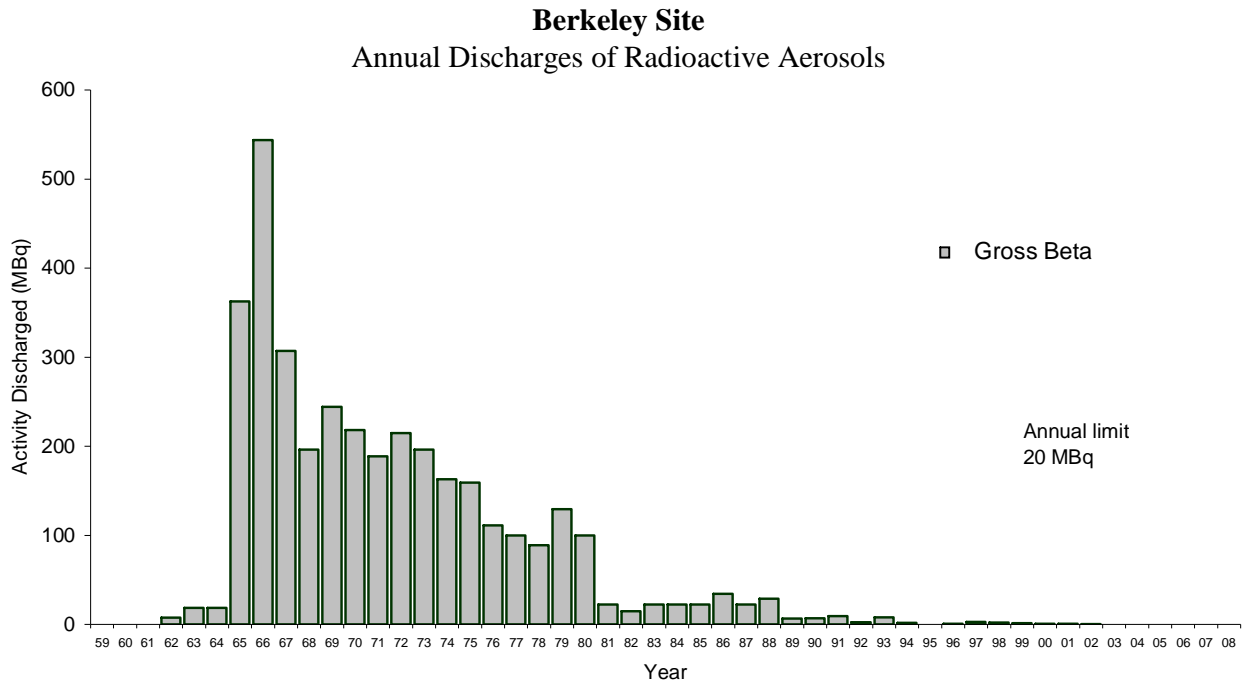


Fig 3.8 *Berkeley Site, Annual Discharges of Radioactive Aerosols - Beta Particulate*

All major gaseous discharges are passed through high efficiency filters before discharge. Particulate material is sampled and analysed for radioactivity. Annual limit of 20 MBq for Berkeley Power Station was introduced by a revised Environment Agency authorisation issued on 1st September 2006 for partial site de-licensing.

Note: Due to Company name change on 1st October 2008, another Certificate of Authorisation was issued to the Berkeley Site.

Berkeley Centre
Annual Discharges of Radioactive Aerosols

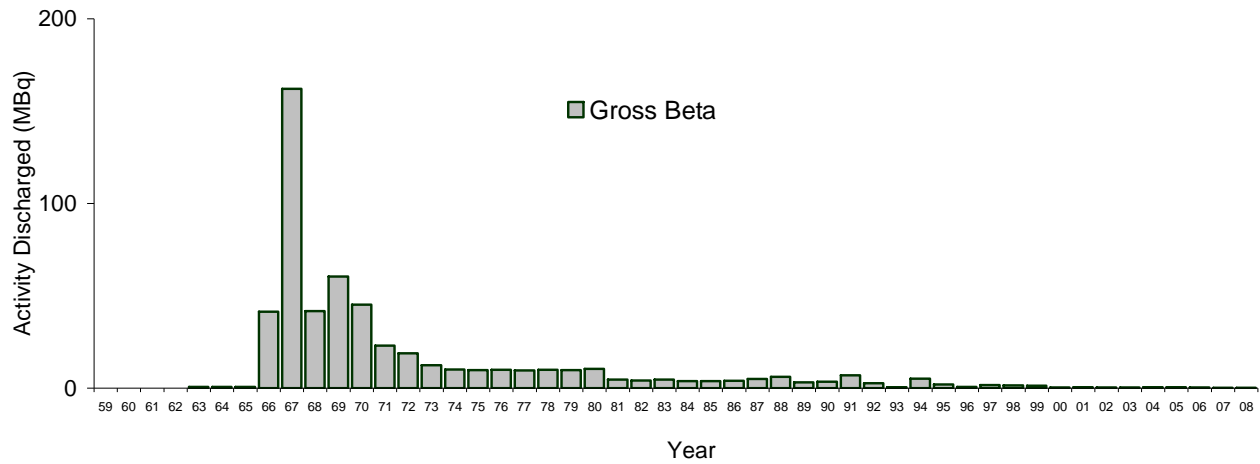


Fig 3.9 *Berkeley Centre, Annual Discharges of Radioactive Aerosols - Beta Particulate*

A revised annual limit of 10 MBq for Berkeley Centre was introduced by a revised Environment Agency authorisation issued on 18 December 2002.

An annual limit of 20 MBq for Berkeley Site (Berkeley Power Station & Shielded Area) was introduced by a revised Environment Agency authorisation issued on 1st September 2006 for partial de-licensing. Berkeley Centre was de-licensed on 1st January 2007.

Note: Due to Company name change on 1st October 2008, another Certificate of Authorisation was issued to the Berkeley Site.

4. LIQUID EFFLUENT DISCHARGES

Site specific authorisations for discharging radioactive liquid effluent to the Severn Estuary are granted by the Environment Agency under the Radioactive Substances Act. Revised discharge authorisations were issued on 18 December 2002 for Oldbury and Berkeley sites following public consultation. The authorisation limits are set after considering the actual quantities of radioactivity each site needs to discharge and the need to keep environmental risks below an acceptable level. Best Practicable Means (BPM) is used to minimise discharges and ensure doses to the public are As Low As Reasonably Practicable (ALARP). The sites would be required to justify that any liquid discharges greater than the Quarterly Notification Level (QNL) were discharged in-accordance with BPM.

At Oldbury the principle source of radioactive liquid effluent arises with the treatment of cooling pond water. Other smaller sources originate from change rooms, laundries and decontamination facilities. Liquid is treated in the effluent treatment plant before passing to final hold up tanks where its radioactive content and chemical make-up are analysed prior to the effluent being authorised for discharge.

Berkeley Site (Berkeley Power Station & Shielded Area) was issued a revised Environment Agency authorisation on 1st September 2006 for partial de-licensing. Berkeley Centre was de-licensed on 1st January 2007.

Note: Due to Company name change on 1st October 2008, another Certificate of Authorisation was issued to the Berkeley Site.

Oldbury Power Station
Annual Liquid Effluent Discharges
Tritium

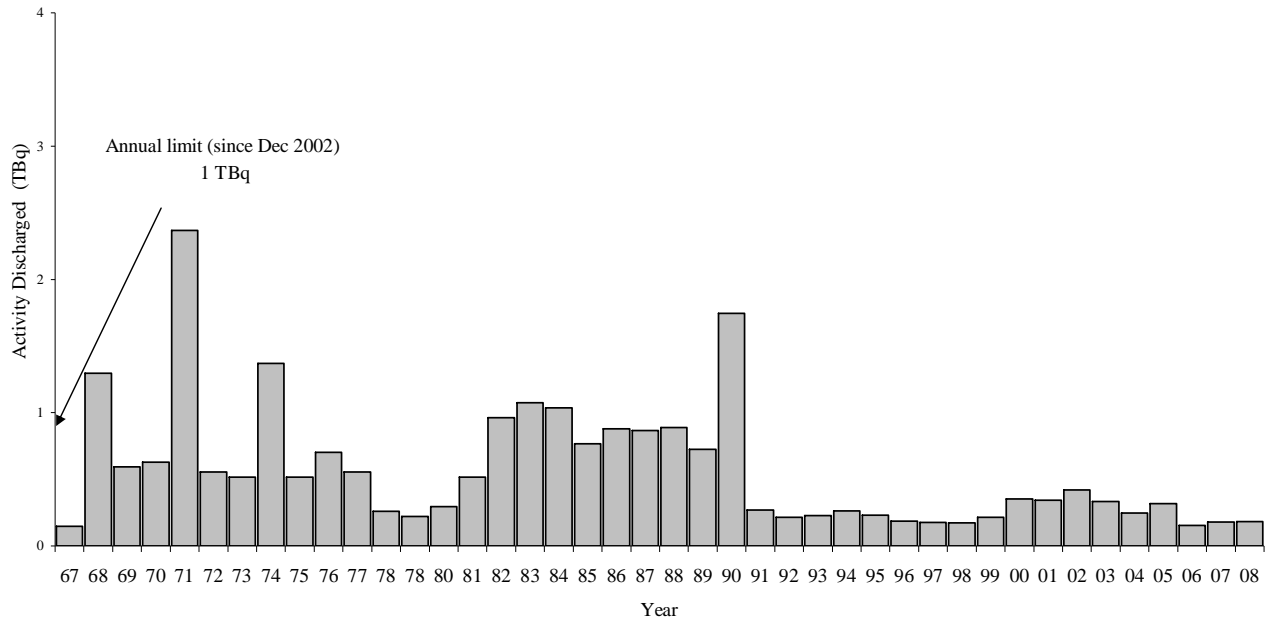


Fig 4.1 *Oldbury Power Station, Annual Liquid Effluent Discharges of Tritium*

Tritium arises in the cooling ponds as tritiated water and is discharged via the effluent treatment plant. Following a site review of systems a revised annual limit of 1000 GBq was introduced by a revised Environment Agency authorisation issued in December 2002.

Berkeley Site
Annual Liquid Effluent Discharges

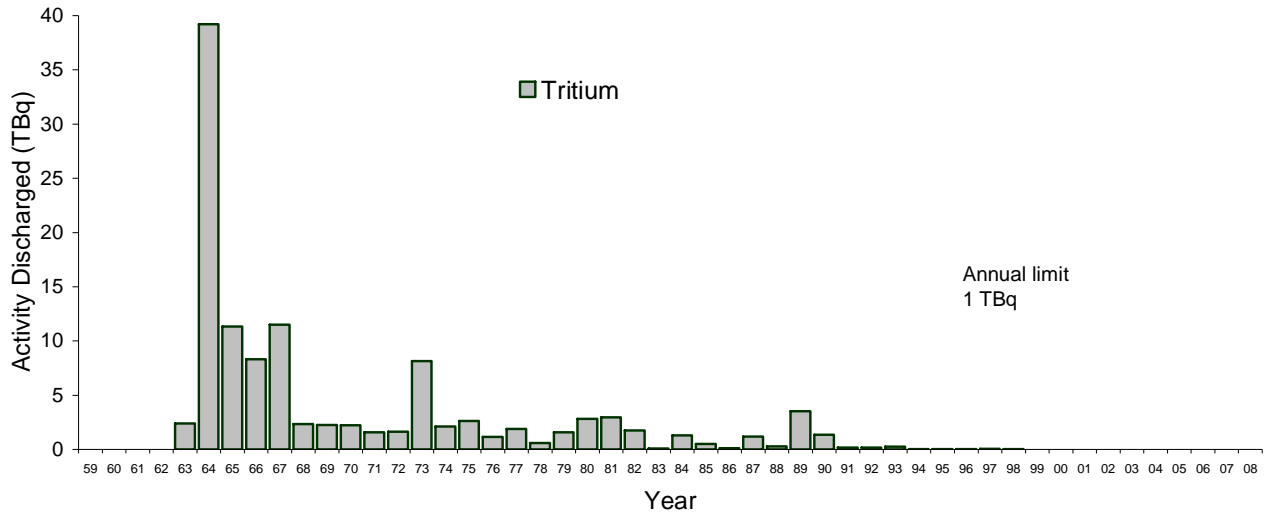


Fig 4.2 *Berkeley Site, Annual Liquid Effluent Discharges of Tritium*

A revised annual limit of 1 TBq was introduced by a revised Environment Agency authorisation issued on 1st September 2006 for partial de-licensing.

Note: Due to Company name change on 1st October 2008, another Certificate of Authorisation was issued to the Berkeley Site.

Oldbury Power Station Annual Liquid Effluent Discharges

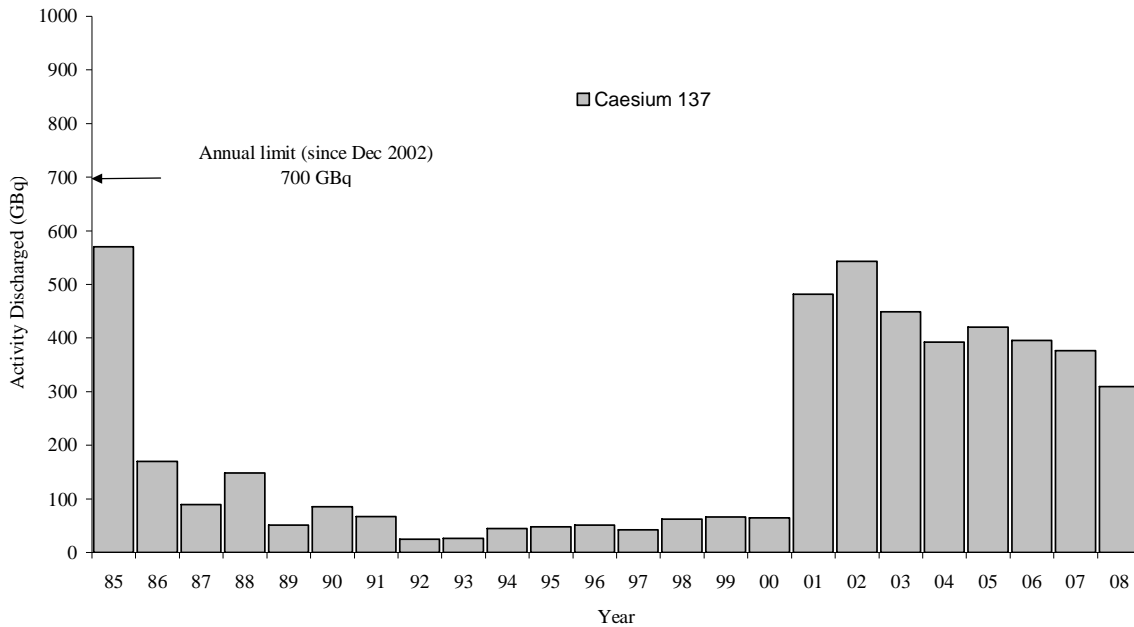


Fig 4.3 *Oldbury Power Station, Annual Liquid Effluent Discharges of Caesium 137*

Caesium-137 is a gamma emitting radionuclide. It is generated as a fission product and contained within the fuel can. Small quantities of highly soluble caesium-137 can be released in pond water. There was no change to the annual limit when the authorisation was revised in December 2002.

Discharges of caesium-137 have increased in recent years. This is related to increases in caesium-137 levels in Sellafield's fuel handling plant, which receives fuel from stations for reprocessing and returns transport skips for re-use. Oldbury now monitor incoming skips for caesium, rejecting those that might release significant quantities of caesium-137 to the cooling ponds.

Berkeley Site Annual Liquid Effluent Discharges

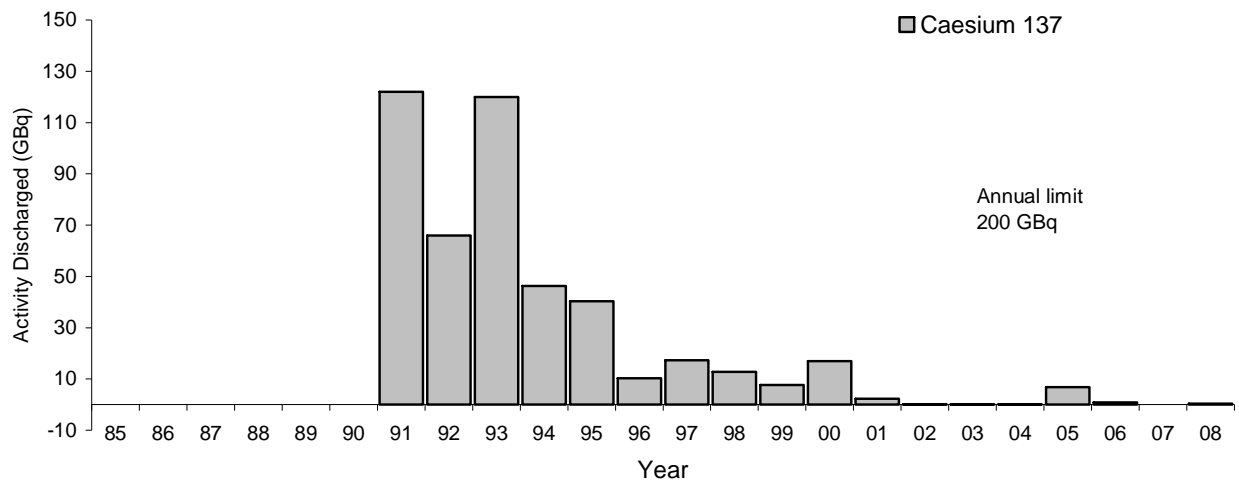


Fig 4.4 *Berkeley Site, Annual Liquid Effluent Discharges of Caesium 137*

The annual limit of 200 GBq continued with a revised Environment Agency authorisation issued on 1st September 2006 for partial de-licensing.

Note: Due to Company name change on 1st October 2008, another Certificate of Authorisation was issued to the Berkeley Site.

Oldbury Power Station Annual Liquid Effluent Discharges

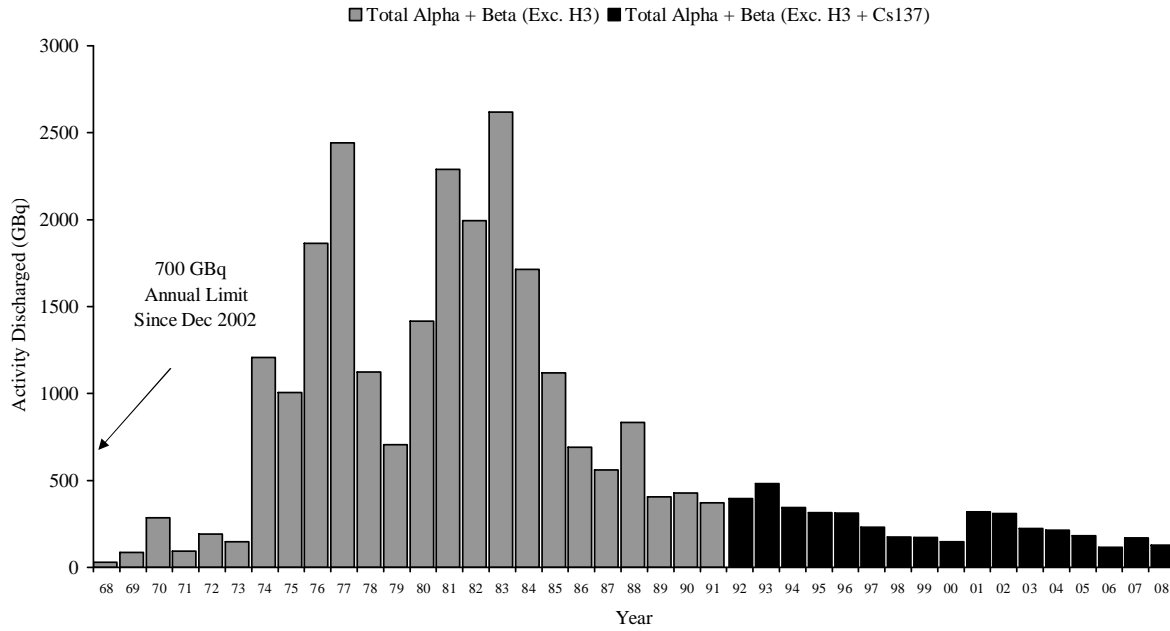


Fig 4.5 *Oldbury Power Station, Annual Liquid Effluent Discharges*

Following a review of site systems a revised annual limit of 700 GBq was introduced by a revised Environment Agency authorisation commencing in December 2002.

Berkeley Site Annual Liquid Effluent Discharges

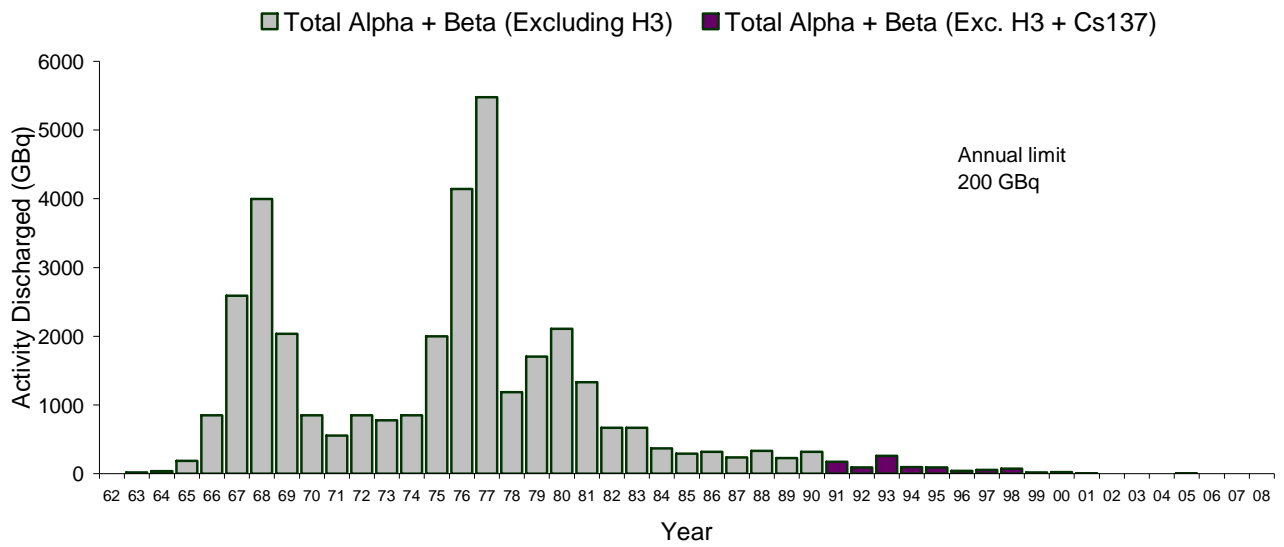


Fig 4.6 *Berkeley Site, Annual Liquid Effluent Discharges*

A revised annual limit of 200 GBq was introduced by a revised Environment Agency authorisation issued on 1st September 2006 for partial de-licensing.

Note: Due to Company name change on 1st October 2008, another Certificate of Authorisation was issued to the Berkeley Site.

Oldbury Power Station
Solid LLW Disposed to (LLWR)
Low Level Waste Repository

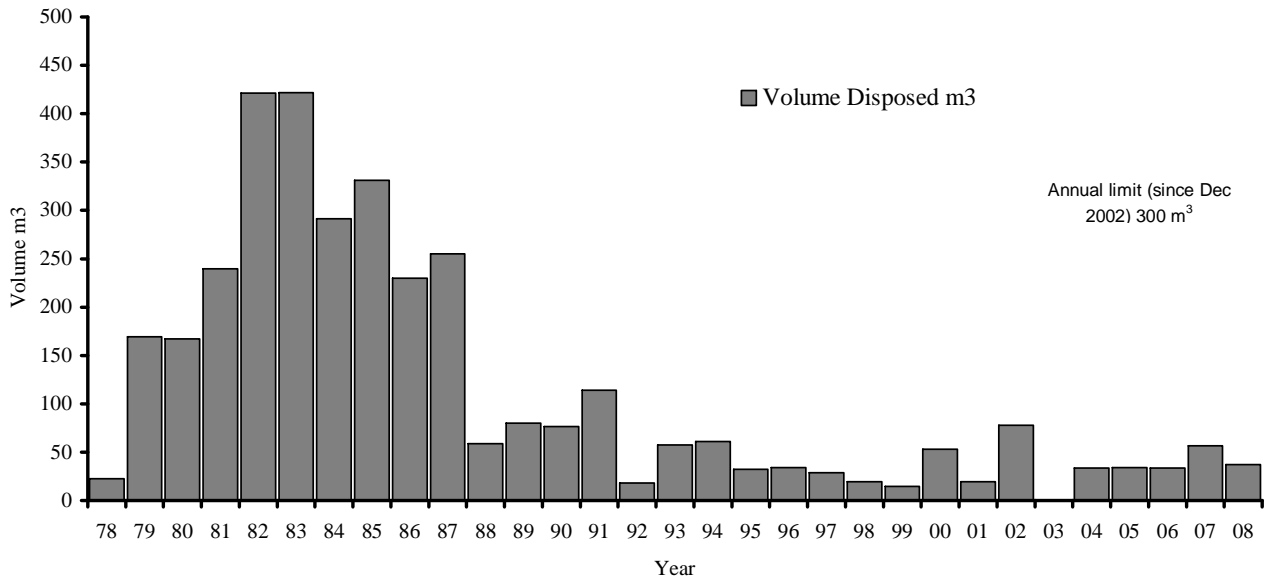


Fig 4.7 *Oldbury Power Station, Annual Disposals of LLW to LLWR*

Low level radioactive waste (LLW) is generated during the operation and maintenance of the power station.

Typical types of waste include filters, clothing and cleaning wipes. The waste is sent to the national low level waste repository (LLWR) in Cumbria for disposal following sorting, treating and compacting to reduce volumes. Certain types of waste are super compacted at Sellafield prior to disposal at the LLWR.

The increase in LLW sent to the LLWR in 2002 was due to disposals of radioactive asbestos waste and extra ash from the burning of a backlog of combustible waste following an incinerator outage. There were no disposals during 2003 which is mainly due to there being no statutory outage.

All disposals are in accordance with limits issued by the Environment Agency. Following a site review of the systems associated with disposal of LLW a revised annual limit of 300 m³ was introduced by a revised Environment Agency authorisation commencing in December 2002.

Berkeley Site
Annual Disposal of LLW to (LLWR)
Low Level Waste Repository

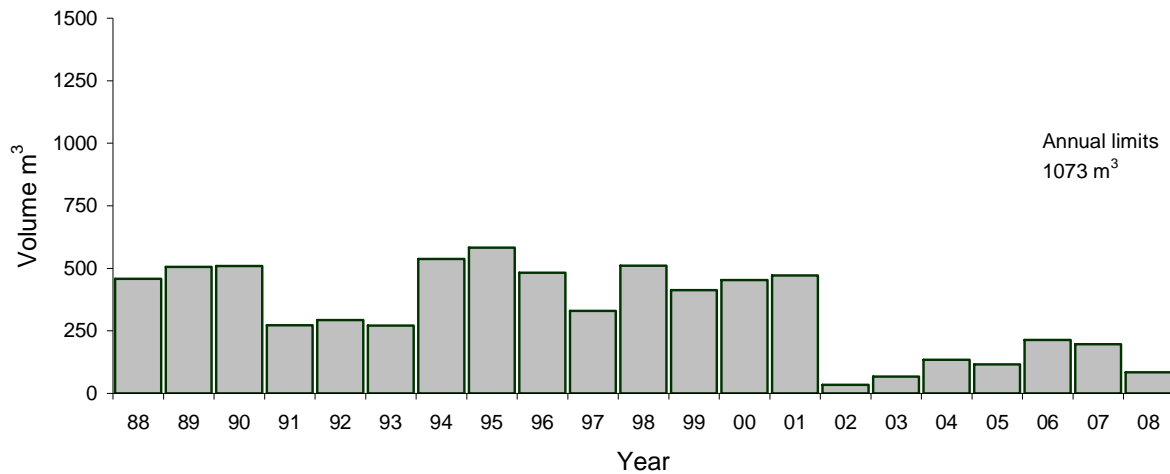


Fig 4.8 *Berkeley Site, Annual Disposals of LLW to LLWR*

Low level radioactive waste (LLW) is generated from decommissioning activities at the Berkeley Site.

The waste is sent to LLWR in Cumbria for disposal following sorting, treating and compaction. Certain types of waste are super compacted at Sellafield prior to disposal at the LLWR.

Operational waste at Berkeley Site has reduced in recent years due to good working practice.

A revised annual limit of 1073 m³ for Berkeley was introduced by a revised Environment Agency authorisation issued on 1st September 2006 for partial site de-licensing.

Note: Due to Company name change on 1st October 2008, another Certificate of Authorisation was issued to the Berkeley Site.

Oldbury Power Station

Solid Waste and Oil Burnt on Incinerator and Oil Burner

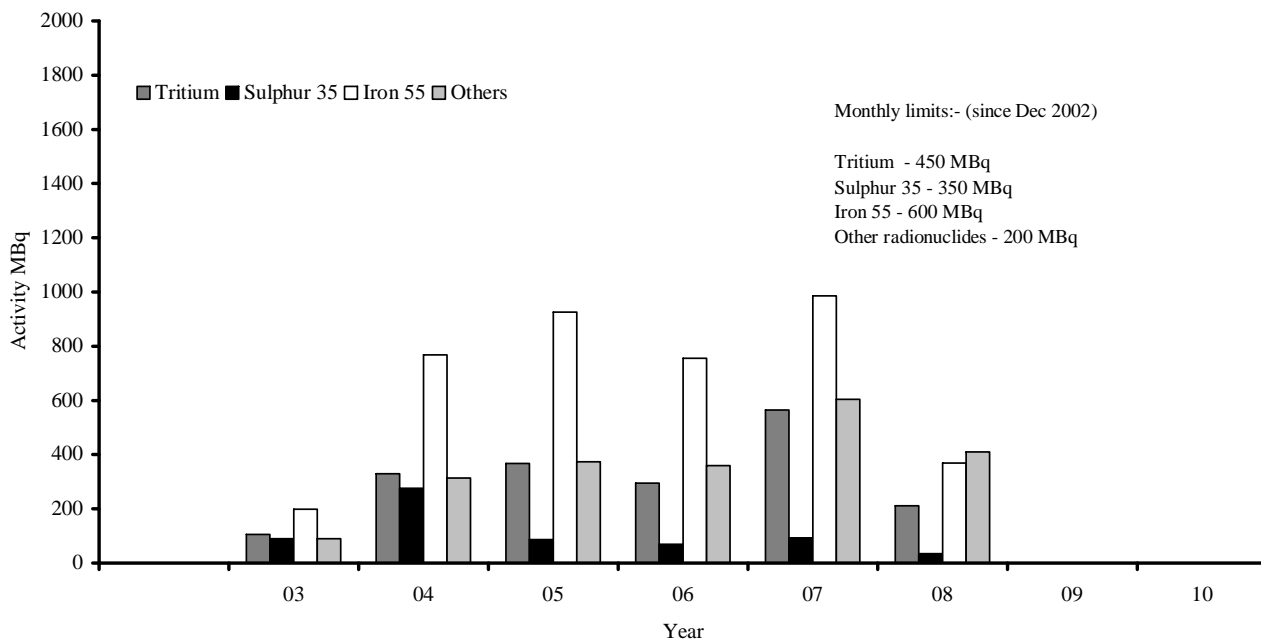


Fig 4.9 *Oldbury Power Station, Solid Waste and Oil Burnt on Incinerator and Oil Burner*

Some of the lubricating oil used on site becomes slightly radioactive. That oil together with combustible low-level waste is burnt on a site incinerator.

All discharges are in accordance with authorisation limits issued by the Environment Agency. Revised monthly limits of 450 MBq for tritium, 350 MBq for sulphur-35, 600 MBq for iron-55 and 200 MBq for other radionuclides were introduced by a revised Environment Agency authorisation commencing in December 2002. The 450 MBq for tritium, 350 MBq for sulphur-35 and 600 MBq for iron-55 are limits that replaced the previous limit of 800 MBq for tritium and sulphur-35.

The graph shows the total activity discharged over the year. During this period the monthly discharges were well below the monthly discharge limits.

5. ENVIRONMENTAL MONITORING

An environmental monitoring programme is carried out by Oldbury Power Station. The purpose of the programme is several-fold but is primarily designed to provide data for the doses to members of the public to be assessed.

Samples such as grass, milk, soil, silt, seaweed, fish and tackishade dust collectors are usually collected all year round and analysed in a specially designed low level counting laboratory. Gamma radiation dose-rates are also measured in the estuary and land sites in concentric rings around the stations. During 2001, programmes were restricted due to the “foot-and-mouth” crisis, as many sampling sites were inaccessible over that period. This not only affected monitoring of milk and pasture, but also monitoring of beaches that could be accessed only via restricted areas. The restrictions on access also prevented exposure to the public over this period. A full programme was re-established by the beginning of 2002.

All results are submitted to the Environment Agency for scrutiny and comparison with their own independent monitoring programmes.

Note: Due to Company name change on 1st October 2008, another Certificate of Authorisation was issued to the Berkeley Site.

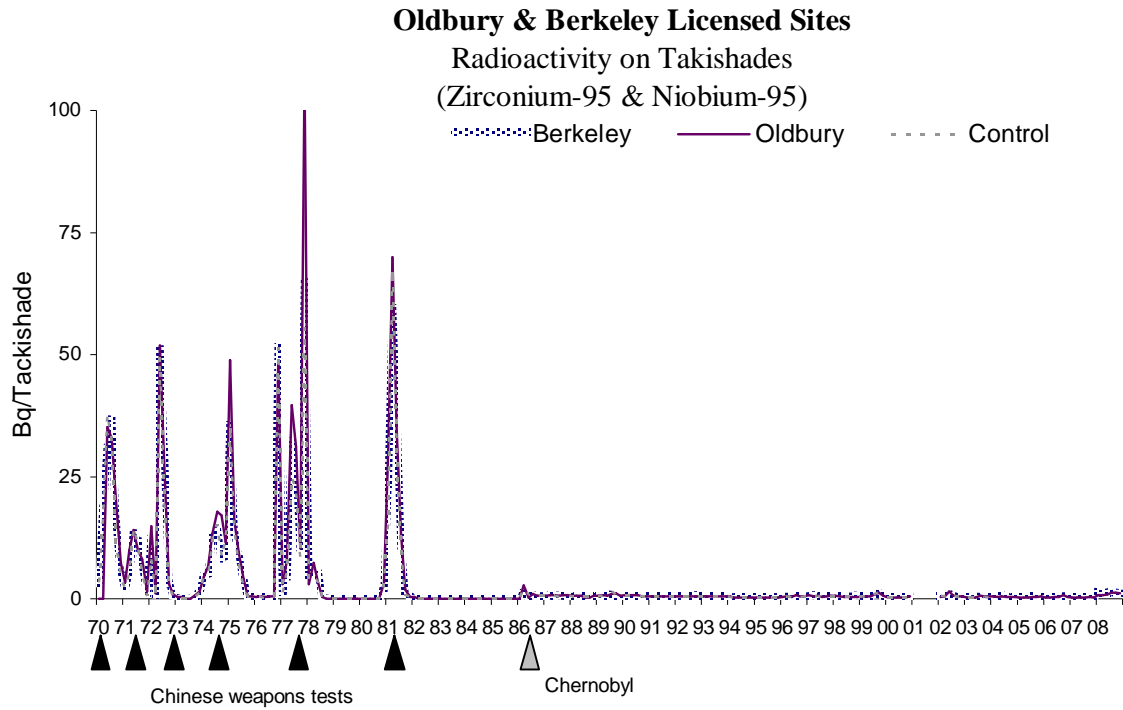


Fig 5.1 *Oldbury & Berkeley Sites, Radioactivity on Tackishades (Zirconium – 95 and Niobium – 95)*

Tackishades are passive dust collectors that are very sensitive indicators of airborne radioactive particulate material. The effects of the Chinese weapons testing above ground in the 1970’s and the Chernobyl accident in 1986 illustrate the sensitivity of these collectors. All readings are now instrument background levels.

Oldbury & Berkeley Licensed Sites Strontium-90 in Milk (Quarterly Mean)

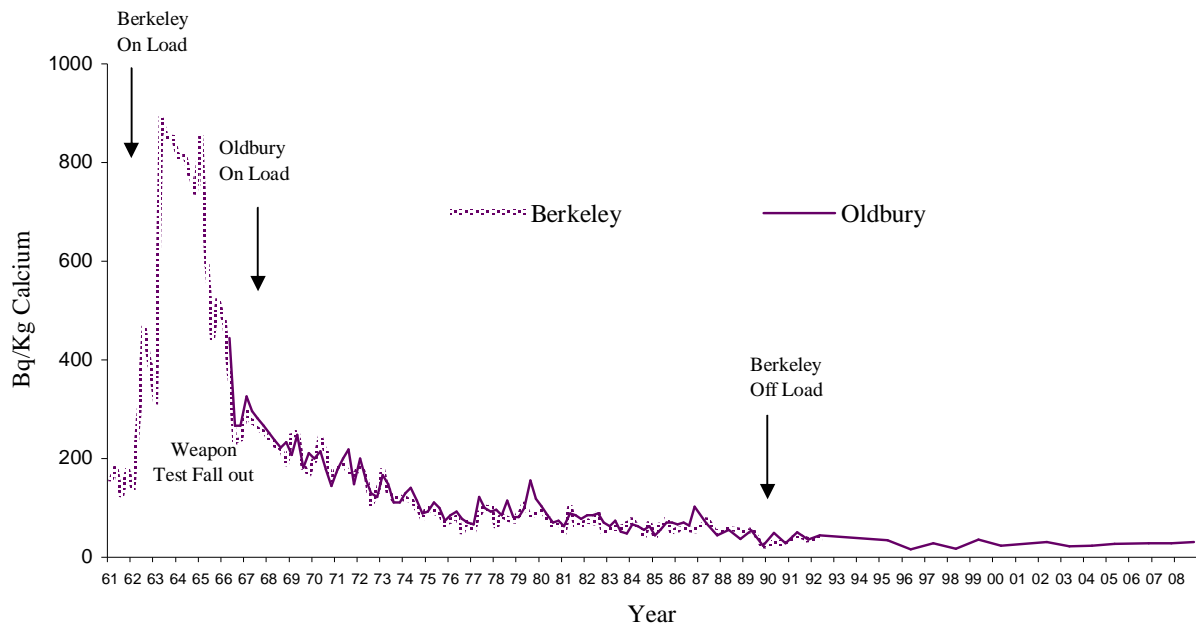


Fig 5.2 *Oldbury & Berkeley Sites, Strontium 90 in Milk*

Radioactive strontium is chemically similar to calcium and like calcium is concentrated in milk. Strontium-90 is a beta emitting radionuclide and is generated in the fuel as a fission product.

Since the removal of fuel and the associated fission products from Berkeley Power Station, strontium-90 in milk analysis has been confined to farms surrounding Oldbury Power Station only. The presence of strontium-90 in milk would only occur in the event of fuel element failure and a subsequent discharge of gas to the environment. All recent results of milk from Oldbury are below minimum detectable activity.

Oldbury Power Station
Radiation Dose rates at 0.5 - 1.0 km Sites

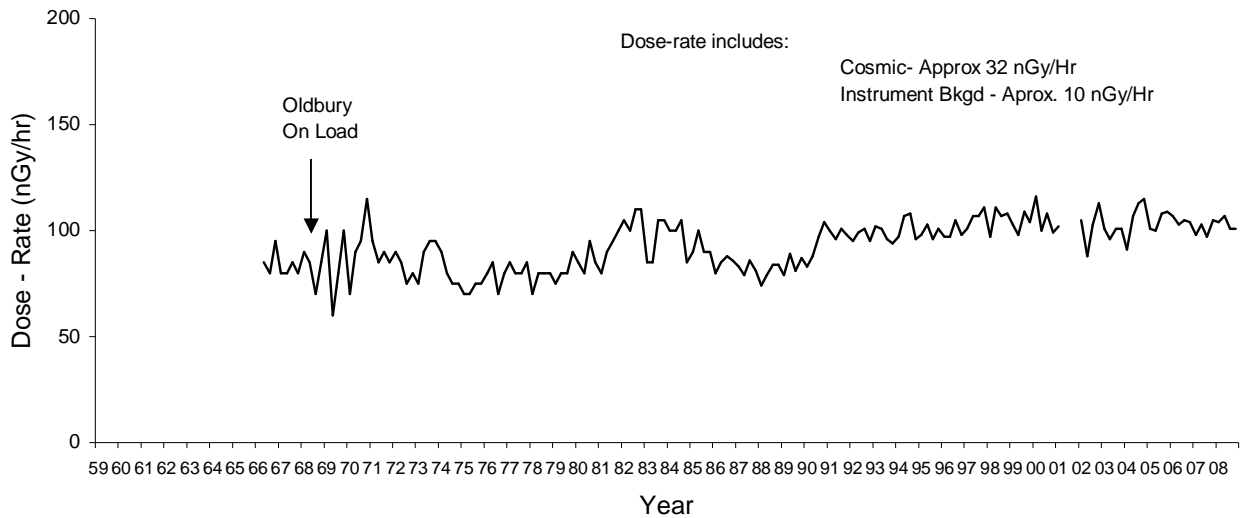


Fig 5.3 *Oldbury Power Station, Radiation Dose rates at 0.5 – 1 km sites*

Gamma dose-rate measurements are regularly taken in an arc around the station at a distance of between 0.5 and 1.0 Km. Gamma dose-rate measurements at greater than 3 km sites show little difference to those taken at closer sites, indicating that gamma dose-rates due to the site’s operations are indistinguishable above natural background dose-rates.

Measurements are taken 1 metre above ground level. Environmental dose-rates include cosmic radiation from outer space, terrestrial radiation from naturally occurring radioactive elements in the ground and instrument background readings.

Measurements will depend on environmental conditions such as cloud cover and atmospheric pressure on the day.

Berkeley Licensed Site
Radiation Dose rates at 0.5 - 1.0 km Sites

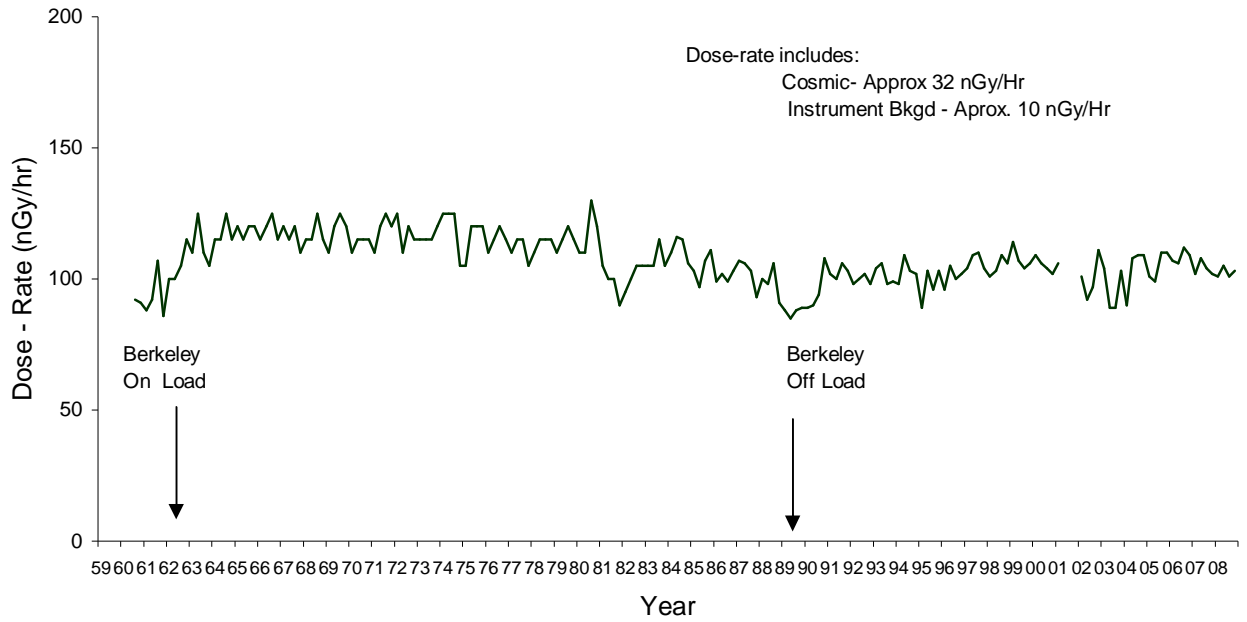


Fig 5.4 *Berkeley Site, Radiation Dose rates at 0.5 – 1 km sites*

Gamma dose-rate measurements at greater than 3 km sites show little difference to those taken at closer sites, indicating that gamma dose-rates due to the site’s operations are indistinguishable above natural background dose-rates.

Oldbury & Berkeley Licensed Sites Radiation Dose rate at 1 - 3 km Sites

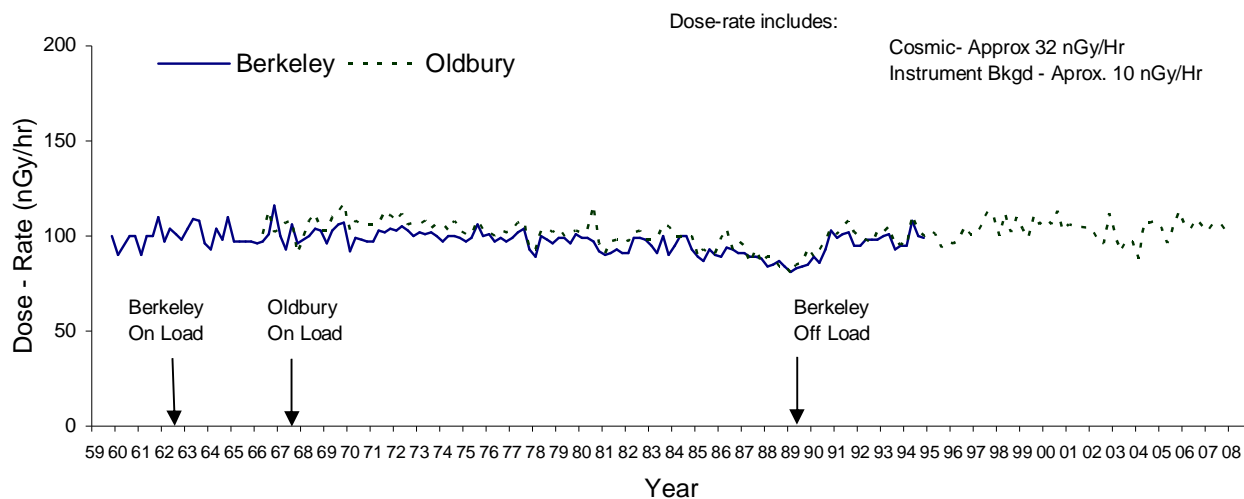


Fig 5.5 *Oldbury & Berkeley Sites, Radiation Dose rates at 1 – 3 km Sites*

Gamma dose-rate measurements at greater than 3 km sites show little difference to those taken at closer sites, indicating that gamma dose-rates due to the sites' operations are indistinguishable above natural background dose-rates.

Oldbury & Berkeley Licensed Sites Radiation Dose rate >3 km Sites

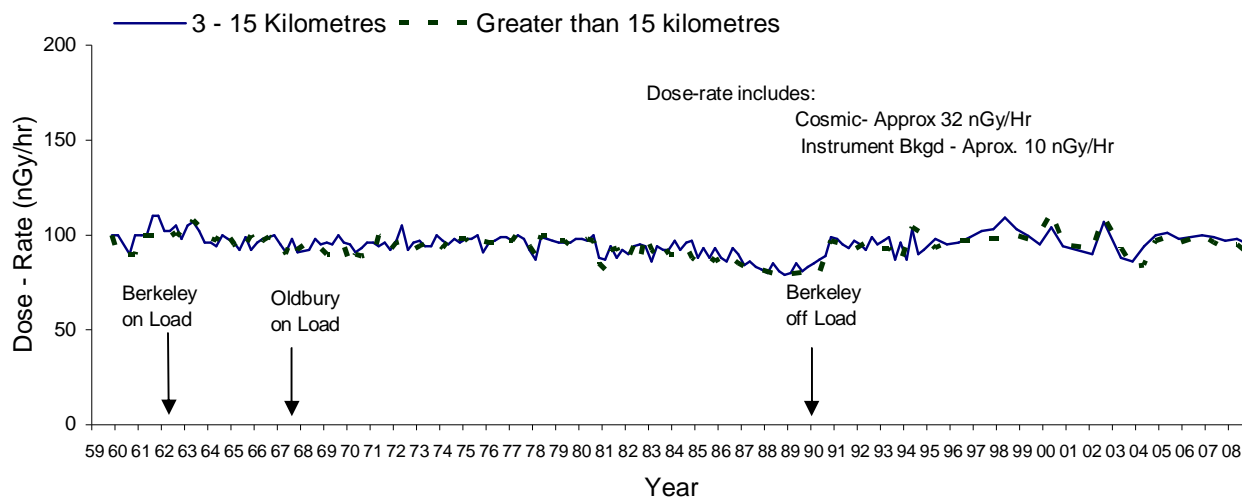


Fig 5.6 *Oldbury & Berkeley Sites, Radiation Dose rates at > 3 km Sites*

Gamma dose-rate measurements at greater than 3 km sites show little difference to those taken at closer sites, indicating that gamma dose-rates due to the sites' operations are indistinguishable above natural background dose-rates.

Oldbury & Berkeley Licensed Sites Radiation Dose rates at Estuary Sites

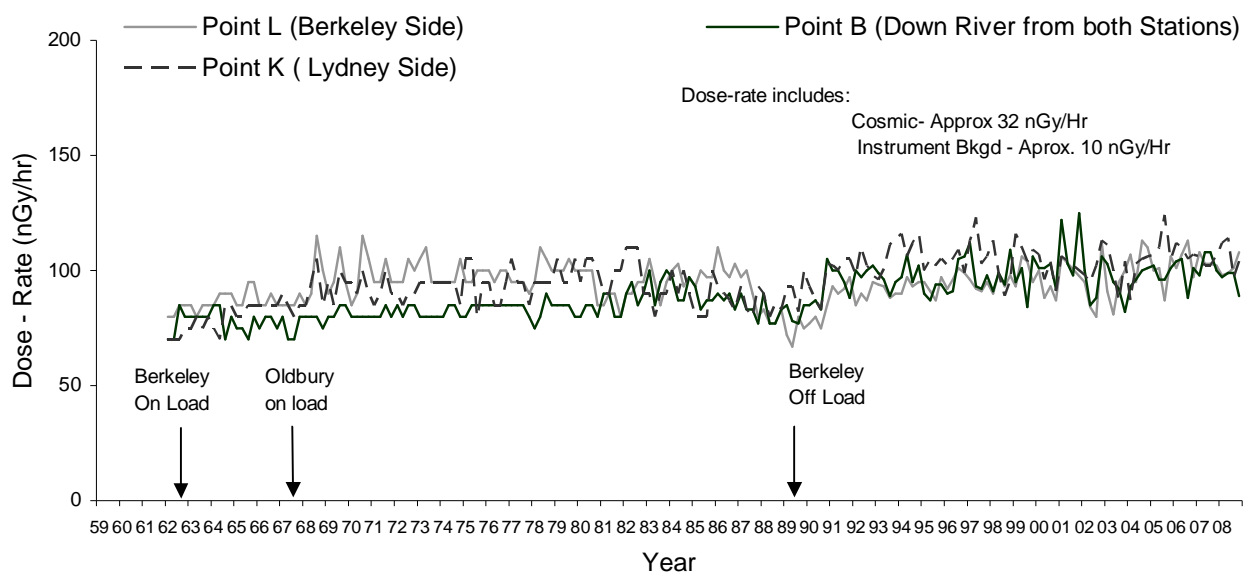


Fig 5.7 *Oldbury & Berkeley Sites, Radiation Dose rates at Estuary Sites*

Gamma dose-rates are measured regularly in the estuary on both sides of the channel. Measurements are taken 1 metre above silt and do vary slightly due to environmental conditions such as cloud cover and atmospheric pressure and the movement of silt and sand in the channel.

Oldbury & Berkeley Licensed Sites Radioactivity in Seaweed - Total Beta

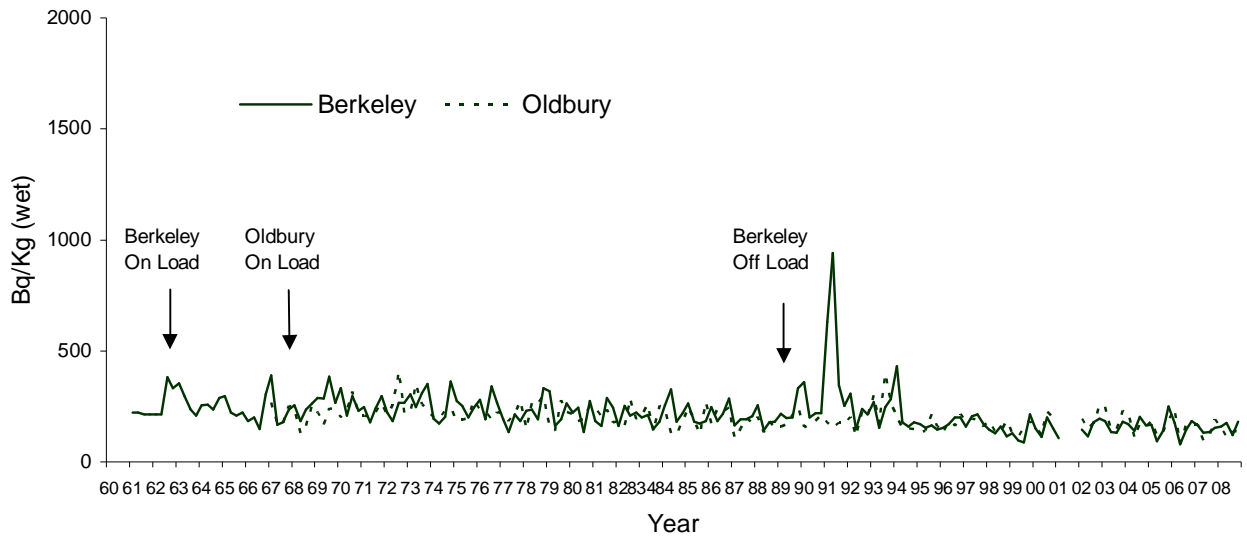


Fig 5.8 *Oldbury & Berkeley Sites, Radioactivity in Seaweed (Total Beta)*

Seaweed is chosen as an indicator material as it tends to concentrate radionuclides such as Caesium-137 and Iodine-131. A large proportion of the radioactivity in seaweed is naturally occurring Potassium-40. The peak in 1991 is attributable to fuel pond decommissioning activities carried out at Berkeley.

Oldbury & Berkeley Licensed Sites Radioactivity in Silt - Total Beta

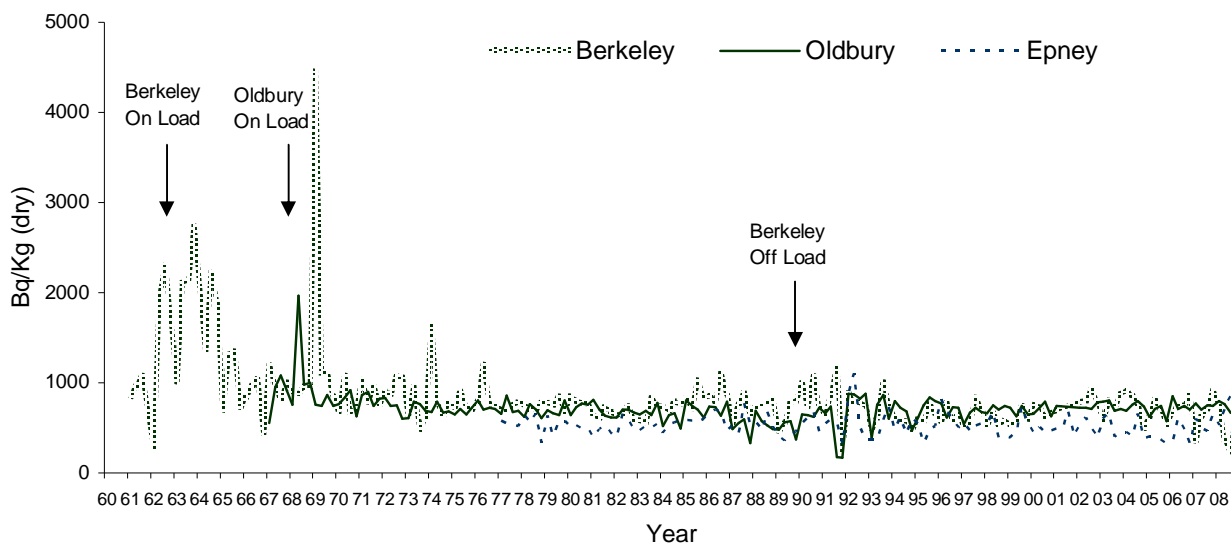


Fig 5.9 *Oldbury & Berkeley Sites, Radioactivity in Silt (Total Beta)*

Silt is collected from inter-tidal areas of the estuary and its radioactive content measured once it is dried. Levels of naturally occurring Potassium-40 vary depending on tidal patterns. Fission products such as Caesium-137 may be detected at very low levels due to the Chernobyl incident in 1986 and residuals from liquid effluent discharges.

Oldbury & Berkeley Licensed Sites
Radioactivity in Fish - Mean Total Beta

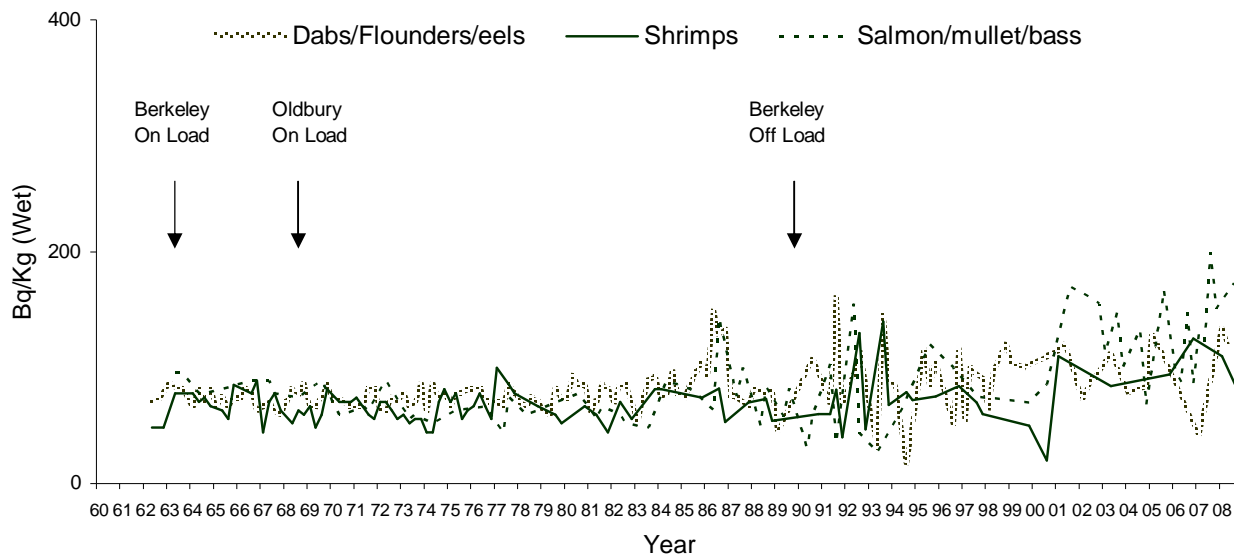


Fig 5.10 *Oldbury & Berkeley Sites, Radioactivity in Fish (Total Beta)*

Samples of commercially caught fish are collected from both sides of the channel and the edible portion analysed.

6. SUMMARY OF RADIATION DOSES TO THE PUBLIC

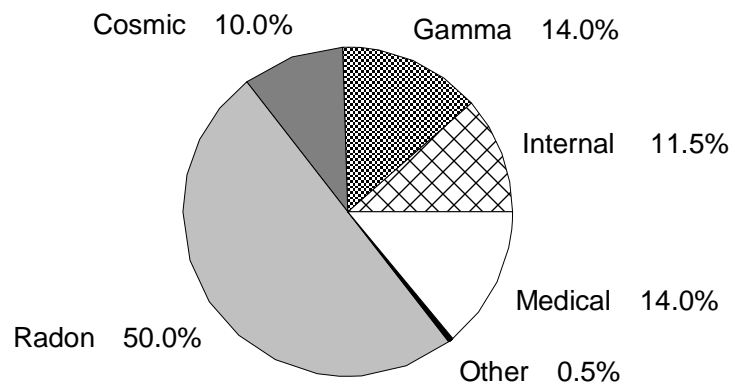
The annual dose in 2007 to members of a small local group of the general public

OLDBURY & BERKELEY

Terrestrial foodstuffs	< 5 μSv
Non-food discharges to air	< 5 μSv
Seafood	18 μSv
External radiation from all sources	61 μSv

The doses are well below the UK legal limit of 1000 μ Sv. The doses may be compared with the annual background dose to the UK population calculated by the Health Protection Agency (HPA) to be 2600 μ Sv.

Average Annual Background Doses - UK Population
2600 μ Sv/person



7. Terms and Definitions

1) Becquerel (Bq)

The Becquerel (Bq) is a unit of radioactivity.

1 Becquerel means one radioactive disintegration per second. The Becquerel is a very small unit.

1,000,000 Bq	=	1 Megabecquerel (MBq)
1,000,000,000 Bq	=	1 Gigabecquerel (GBq)
1,000,000,000,000 Bq	=	1 Terabecquerel (TBq)

2) Gray (Gy)

The Gray (Gy) is a unit of absorbed dose.

1 Gray is the special name given for one joule of energy from ionising radiation absorbed in one kilogram of a substance.

$$\frac{1}{1,000,000,000} \text{Gy} = 1 \text{ nanoGray (nGy)}$$

3) Sievert (Sv)

1 Sievert (Sv) is a unit of effective absorbed dose.

The Sv is a measure of radiation dose equivalent, i.e. it takes into account the biological effect of the particular radiation being considered.

$$\frac{1}{1,000} \text{Sv} = 1 \text{ milliSievert (mSv)}$$

$$\frac{1}{1,000,000} \text{Sv} = 1 \text{ microSievert (}\mu\text{Sv)}$$

4) ALARP

ALARP is the term used to ensure that the doses to staff and the public are controlled such that they are As Low As Reasonably Practicable.

5) BPM

The operator shall not be required to incur expenditure whether in money, time or trouble which is or is likely to be, grossly disproportionate to the benefits